

Amendments to the Drawings:

Attached hereto is a drawing labeled "Replacement Sheet" depicting a new FIG. 1a, which Applicants are requesting to substitute for the drawing sheet previously associated with FIGS. 1a and 1b as originally filed. Also submitted is a copy of a drawing sheet labeled "Annotated Mark-Up Drawing" showing the previous drawing sheet depicting FIGS. 1a and 1b, which sheet is marked to show the changes requested herein.

For the previous drawing depicting FIGS. 1a and 1b as originally filed (and as shown on the "Annotated Mark-Up Drawing"), Applicants are requesting to delete prior FIG. 1a as it appears redundant with FIG. 1 except for size, as noted in the Office Action. Applicants are also requesting that the remaining figure on the sheet be rotated 90 degrees and also relabeled as the new FIG. 1a. Further, Applicants are requesting that areas previously identified by "A" and "B" respectively, be reversed as also suggested by the Examiner in the Office Action. Reference numeral "2" has also been changed to – 21 – to avoid any potential confusion with reference numeral "2" also appearing on FIG. 1.

Amendments have been made in the Specification as needed to implement these changes in the drawings. No new matter is involved.

REMARKS

I. Status of the Specification, Claims, and Drawings

The Specification is objected to for the reasons set forth on pages 4-5 of the Office Action. In particular, the Abstract is objected to for use of certain terms, the overall length, and use of more than one paragraph. The Specification is also objected to due to the description of the drawings for FIGS. 1, and FIGS. 1-a and 1-b.

Claims 1-25 are pending. Claims 1-17 are rejected and Claims 18-25 are withdrawn in view of the earlier restriction requirement. Claims 1-3, 7-8, 10-12 and 14-17 are rejected under 35 USC §102(b) as anticipated by US Patent 6,454,274 (White et al.). Claims 4-6, 9, and 13 are rejected under 35 USC 103(a) as unpatentable over White et al. in view of the article identified as "Fabrication of Ceramic-Membrane Tubes For Direct Conversion of Natural Gas" by Balachandran et al. (hereafter "Balachandran et al."). Claims 1-17 are also objected to for the various informalities as stated on pages 5-7 of the Office Action.

The drawings are objected to for reasons stated on pages 3-4 of the Office Action. In particular, it is said that the mechanical means of Claim 12 must be shown in the figures or the feature deleted from the claims. Also, FIG. 1-a is objected to as being just a reduced version of FIG. 1, and also due to the reversal of locations designated as "A" and "B".

II. Concerning the Amendments

Applicants have herein requested amendment of the drawing sheet previously depicting FIGS. 1-a and 1-b, so that FIG. 1-a as originally submitted is deleted, and that FIG. 1-b as originally submitted is rotated 90 degrees and relabeled as "FIG. 1-a". Applicants have also requested that joint "2" on the previous drawing sheet be amended to a new reference numeral – 21 --, so minimize confusing that might arise relative to FIG. 1, which uses the reference numeral "2" in relation to the girdle member. Applicants have also reversed the locations identified as "A" and "B" on new FIG 1-a, to be consistent with use in FIG. 1. However,

Applicants wish to point out that the use of the letters "A" and "B" in the original figures was reversed intentionally, in that location "B" was deemed to be an area of higher pressure relative to area "A". Appropriate amendments in the Specification, as suggested in the Office Action, have also been made to implement these changes in the figures. No new matter is involved.

The Specification is also amended to substitute a replacement Abstract and thereby address the objections to the original Abstract as set forth in the Office Action.

Claims 1, 4-5, 7-9, 11, and 15-17 are amended to address the claim objections referenced in the Office Action. Applicants are making these amendments to address the formalities objections and they are thus merely clarifying in nature, and are not made to address any rejection or potential rejection that might be made under 35 USC §112. Support for the amendments appears in the claims as originally filed. No new matter is involved.

Claims 12 and 18-25 are canceled without prejudice. Applicants do not agree with the grounds for objection of the drawings relative to the so-called mechanical means feature of Claim 12. However, cancellation of Claim 12 moots the objection. Claims 18-25 are canceled in view of the earlier restriction requirement.

Applicants appreciate the Office's careful review of the Application and notation of the various informalities for correction.

III. The Claimed Invention

In a broad aspect, the present invention relates to a joint resistant to fluid leakage, which joint comprises:

a girdle of a metallic material capable of undergoing deformation without rupture,

a first rigid member with a tapered outer mating surface, and

a second rigid member with a tapered inner mating surface,

the girdle being disposed between and contiguous with the tapered mating surface of the first rigid member and the tapered inner mating surface of the second rigid member, wherein differential pressure across the joint provides compressive force upon the girdle through the mating surfaces thereby improving resistance to fluid leakage through the joint.

The joints of the present invention are particularly advantageous for joining gas-tight members having different coefficients of thermal expansion, wherein a difference in fluid pressure across the joint provides compressive force upon the girdle, and thereby improves resistance to fluid leakage across the joint. See, Specification at page 1, lines 4-11. In embodiments, the girdle used in forming the joint may comprise a composite material. Specification at page 1, lines 11-16 and page 7, lines 18-29. The joint may eliminate a need for mechanical devices to hold the joint in place. Specification, at page 4, lines 7-9.

IV. Concerning Rejection under §102(b)

Claims 1-3, 7-8, 10-12, and 14-17 are rejected under 35 USC §102(b) as anticipated by the teachings of White et al. The Office Action indicates that White et al. disclose a joint assembly for joining a ceramic membrane to a tube sheet to support the ceramic membrane within a reactor. The Office Action continues by stating that the sealing element can be formed of aluminosilicate or zirconia fibers, a paper or felt stuffing of a ceramic material, a ceramic of vermiculite, or a layer of ceramic powder or graphite packing. It is also said that White et al. also disclose infiltrating the fibers with particulates of refractory ceramics, ceramic powders or particles of metal, such as gold. These teachings appear to be in column 4, lines 33-58 and column 5, lines 29-41 of the reference.

It is clear that the sealing elements disclosed or suggested by White et al. are ceramic (non-metallic materials). Applicants also note that White et al. teach at column 6, lines 42-45 that "...any sealing element used to effectuate a seal in the extreme environment contemplated by the present invention must be designed to retain its shape...." (emphasis added). Thus, White et al. teach use of a seal which does not undergo deformation, unlike the girdle of the claimed invention herein. As a result, White et al. require use of the so-called "fixture" and "follower" mechanical members which are used to apply compression to the joint assembly.

The presently claimed invention uses a girdle of a metallic material capable of undergoing deformation without rupture. This feature is not taught or suggested by White et al. In fact, White et al. teach use of a sealing element which must retain its shape under use. Due to this significant difference, Applicants respectfully submit that the teachings of White et al do not anticipate the claimed invention herein. Applicants traverse the rejection and request withdrawal of the rejection.

V. Concerning Rejection Under §103 (a)

Claims 4-6, 9 and 13 are rejected under 35 USC §103 (a) as unpatentable over White et al. in view of Balachandran et al. As discussed above, there are significant differences between the teachings of White et al. and the claimed invention herein. White et al. do not teach the use of a sealing element of a metallic material, nor one that is capable of undergoing deformation without rupture. The teachings by White et al. suggest the opposite, i.e., that the sealing element must retain its shape. The teachings of Balachandran et al. are directed, as the Office Action recognizes, to use of specific ceramic membranes. The teachings by Balachandran et al. are not directed to sealing members and thus, add nothing to the teachings by White et al.

As a result, Applicants submit that Claims 4-6, 9 and 13 are not rendered obvious in view of the combined teachings by White et al. and Balachandran et al. Applicants submit that the combined teachings direct one away from using a sealing element which will undergo deformation, such as according to the present invention. Applicants respectfully traverse the rejection and request withdrawal of the rejection and reconsideration for these reasons.

VI. Concluding Remarks

Applicants acknowledge the Office's withdrawal of Claims 18-25 in view of the earlier restriction requirement. Claims 18-25 have been canceled without prejudice herein in view of the restriction requirement.

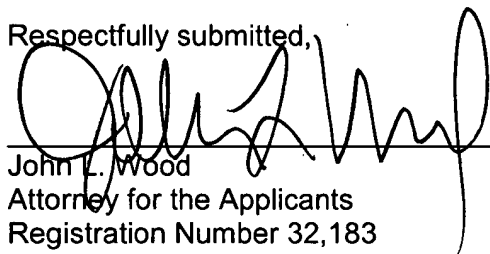
Applicants acknowledge the objections to the Information Disclosure Statement dated December 27, 2004. A replacement disclosure statement is submitted herewith, with the required fee, to address the grounds for objection raised in the Office Action.

Applicants have reviewed the art made of record, but not relied upon in the Office Action. Applicants do not believe the art is relevant to patentability of the pending claims herein.

In view of the foregoing Amendments and Remarks, Applicants respectfully request that the objections to the Specification, Claims and Drawings as set forth in the Office Action be withdrawn, and that rejection of Claims 1-17 as set forth in the Office Action also be withdrawn and that such claims be reconsidered. Applicants submit all pending claims herein are in condition for allowance and such is respectfully solicited at an early date.

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Respectfully submitted,

A handwritten signature in black ink, appearing to read "John L. Wood", is written over a horizontal line.

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ABSTRACT

A composite joint ~~Composite joints~~ for gas-tight members constructed of materials that exhibit different coefficients of thermal expansion is used for supporting a membrane material in a reactor~~are disclosed~~. Broadly, the apparatus of the invention provides composite joints which include a girdle of a resilient material disposed between mating surfaces of a high strength metallic member and a nonmetallic member in an arrangement wherein a difference in fluid pressures across the joint provides compressive force upon the girdle through tapered mating surfaces thereby improving resistance to fluid leakage. The composite~~Composite joints of the invention~~ are particularly useful for joining a high strength weldable metallic conduit and a gas-tight ceramic member having a tubular structure, closed at one end, with a tapered mating surface at a distal end thereof contiguous with a portion of the girdle. Processes using such joints include those which convert methane into synthesis gas.

~~Processes beneficially using joints in accordance with the invention include converting methane gas into value-added~~²⁰~~products, for example, production of synthesis gas comprising carbon monoxide and molecular hydrogen. , Advantageously, the synthesis gas is free of deleterious and/or inert gaseous diluents such as nitrogen."~~

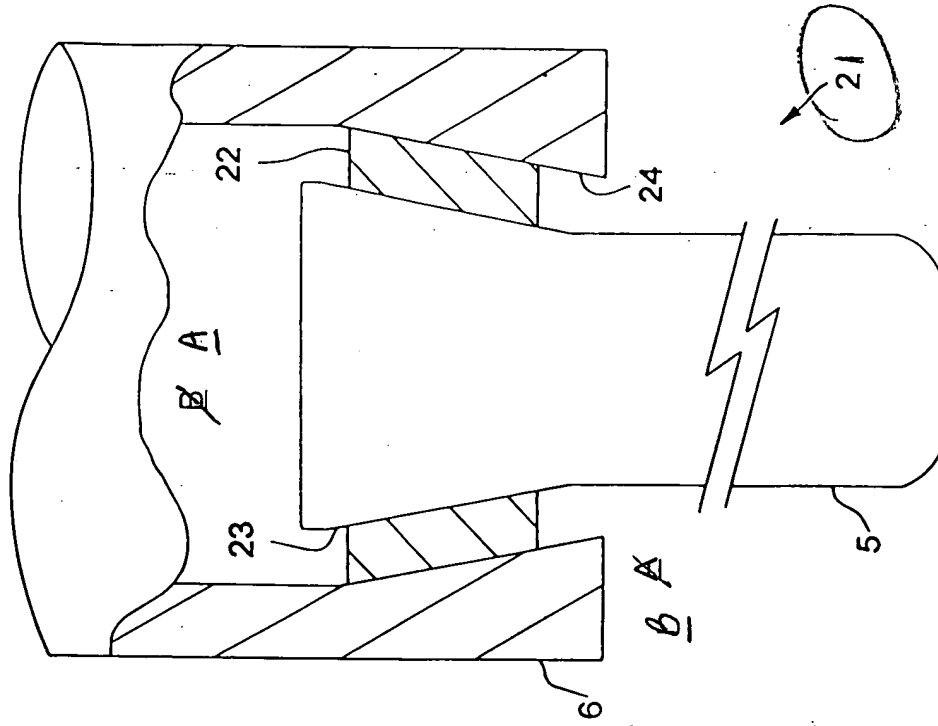


FIG. 1b

Rotate
90°

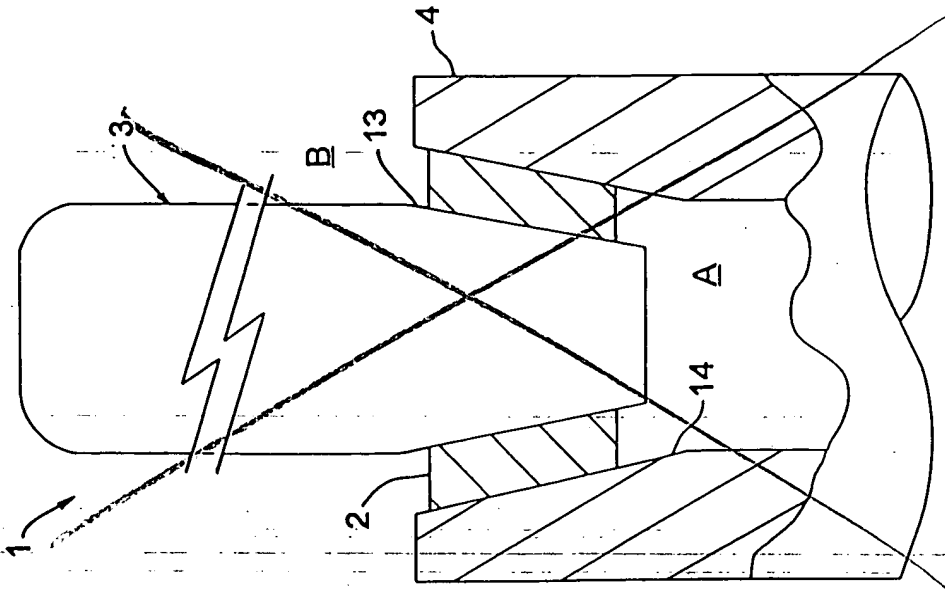


FIG. 1a